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(54) Abstract Title
Random access request over a common CDMA channel using a preamble with a selected signature

(57) The invention relates to packet and random access in which multiple terminals (eg mobile phones) transmit data via a common code division multiple access (CDMA) channel. Terminals select one of available preamble signatures and one of available access slots and transmit a preamble (Fig.5). A base station tries to acquire the preamble and then broadcasts to all terminals whether the preambles are acquired or not (Fig.6). The terminals then transmit a data or retransmit a preamble according to the result of the preamble acquirement (Fig.5). The apparatus and method have improved network efficiency by reducing unnecessary data transmission and interference signal. An improved characteristic of time delay by ramping to adequate power level more quickly by re-transmitting preamble-by-preamble.

FIG. 3A

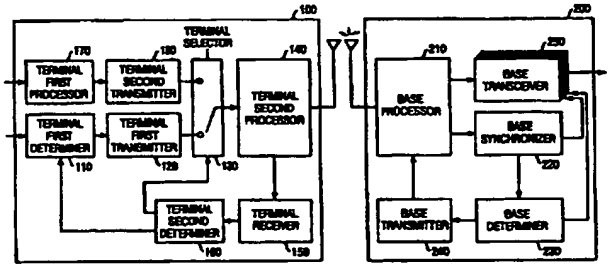

FIG. 3B

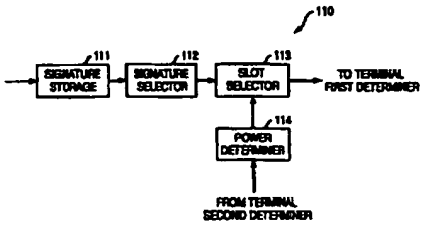

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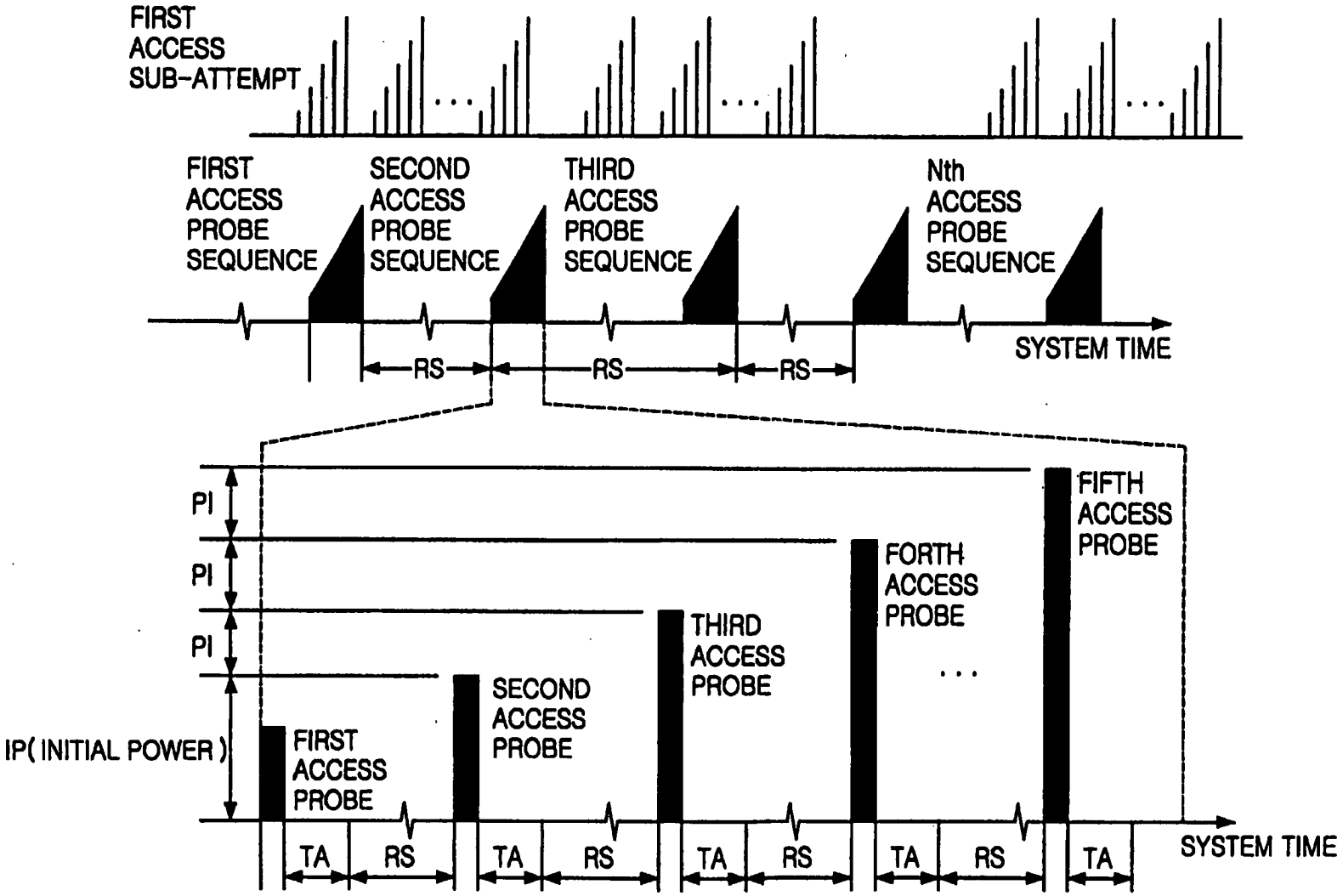
FIG. 1
(PRIOR ART)



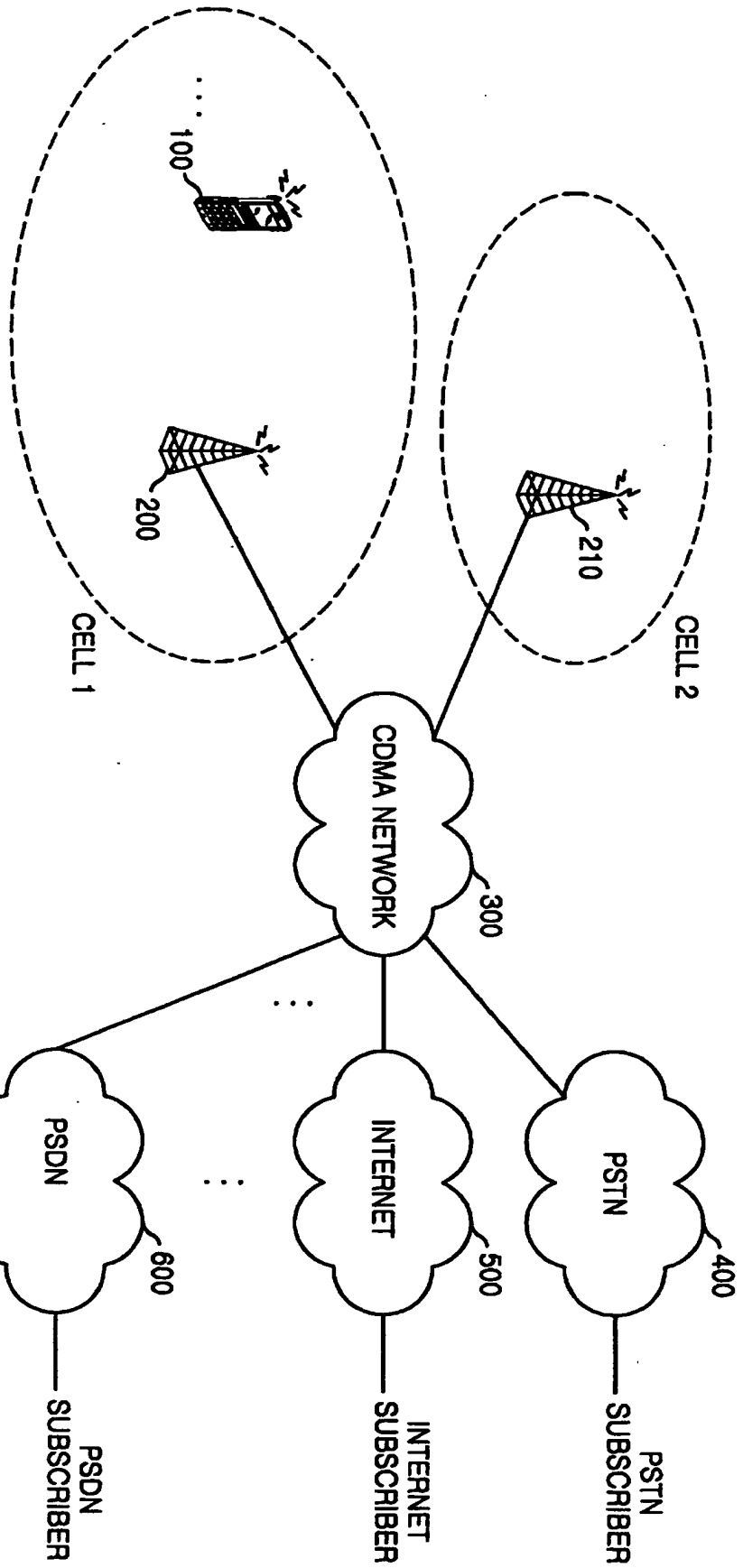

100
200
210
CELL 1
CELL 2
CDMA NETWORK
300
PSTN
400
INTERNET
500
PSDN
600
PSTN SUBSCRIBER
INTERNET SUBSCRIBER
PSDN SUBSCRIBER

FIG. 2

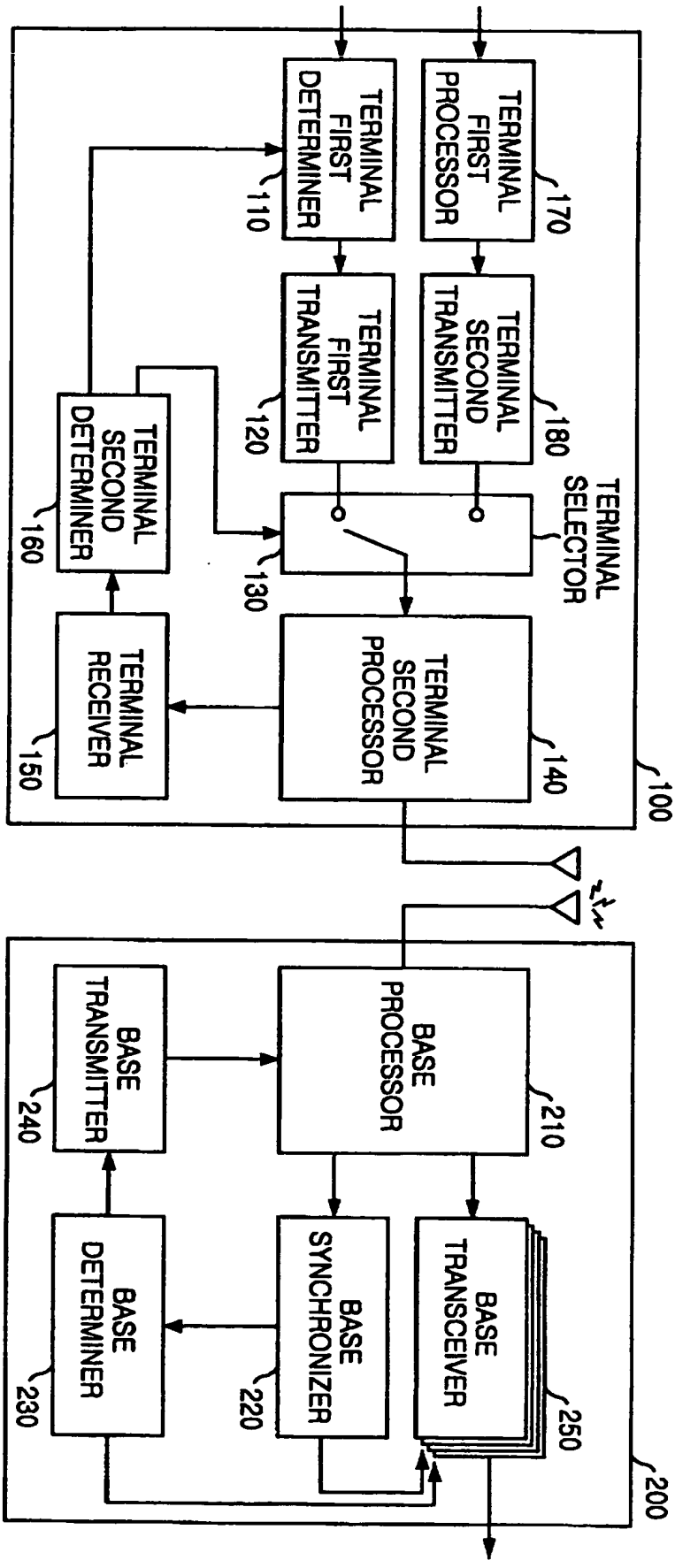

TERMINAL FIRST PROCESSOR
170
TERMINAL FIRST DETERMINER
110
TERMINAL SECOND TRANSMITTER
180
TERMINAL FIRST TRANSMITTER
120
TERMINAL SELECTOR
TERMINAL SECOND DETERMINER
160
130
TERMINAL RECEIVER
150
TERMINAL SECOND PROCESSOR
140
100
BASE TRANSMITTER
240
BASE PROCESSOR
210
BASE DETERMINER
230
BASE SYNCHRONIZER
220
BASE TRANSCEIVER
250
200

FIG. 3A

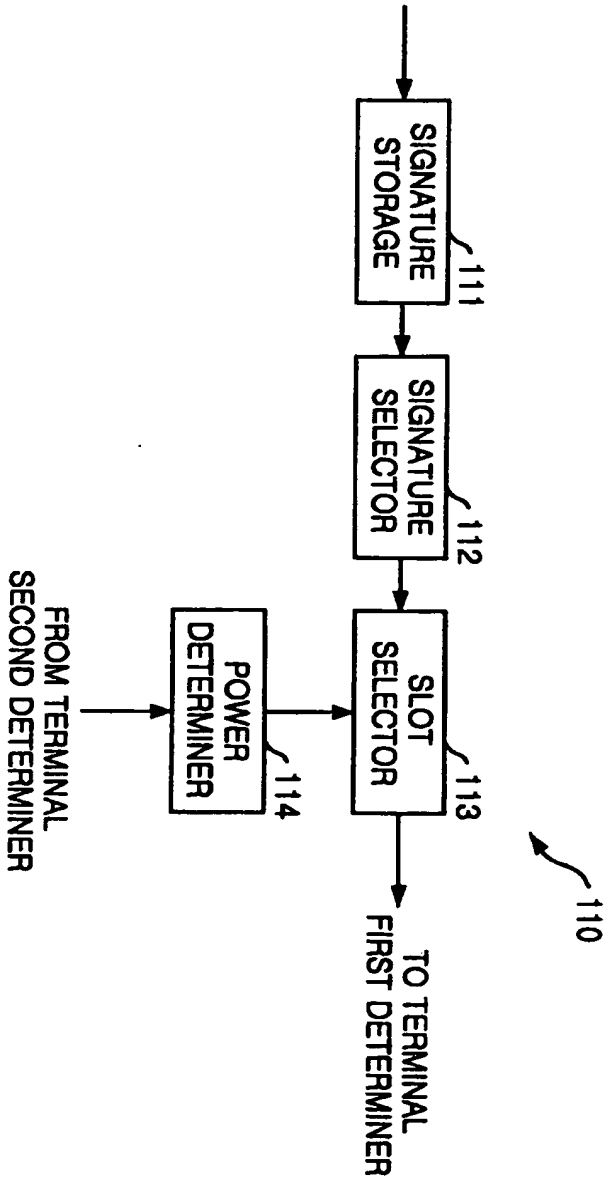

SIGNATURE STORAGE
111
SIGNATURE SELECTOR
112
SLOT SELECTOR
113
POWER DETERMINER
114
FROM TERMINAL SECOND DETERMINER
TO TERMINAL FIRST DETERMINER
110

FIG. 3B

FIG. 4

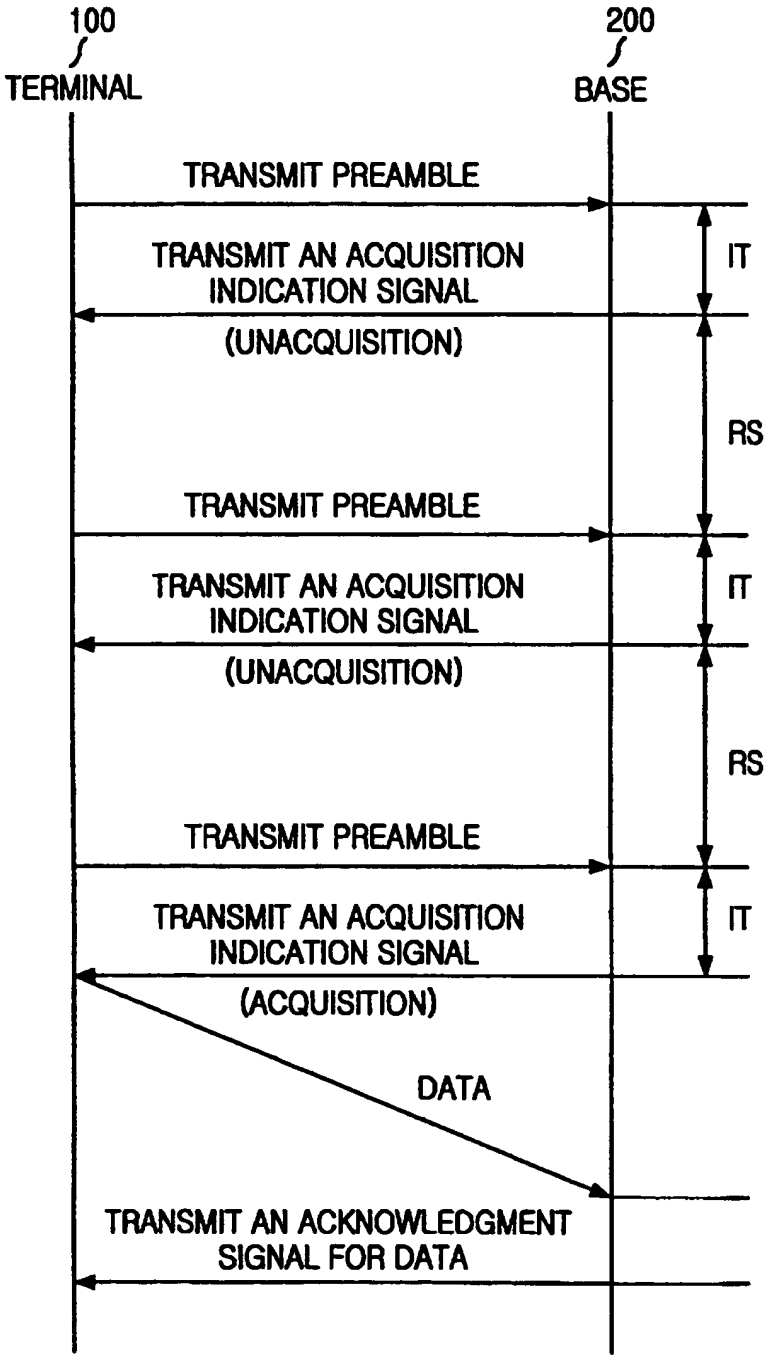

100
TERMINAL
200
BASE
TRANSMIT PREAMBLE
TRANSMIT AN ACQUISITION INDICATION SIGNAL
(UNACQUISITION)
IT
RS
TRANSMIT PREAMBLE
TRANSMIT AN ACQUISITION INDICATION SIGNAL
(UNACQUISITION)
IT
RS
TRANSMIT PREAMBLE
TRANSMIT AN ACQUISITION INDICATION SIGNAL
(ACQUISITION)
IT
DATA
TRANSMIT AN ACKNOWLEDGMENT SIGNAL FOR DATA

FIG. 5

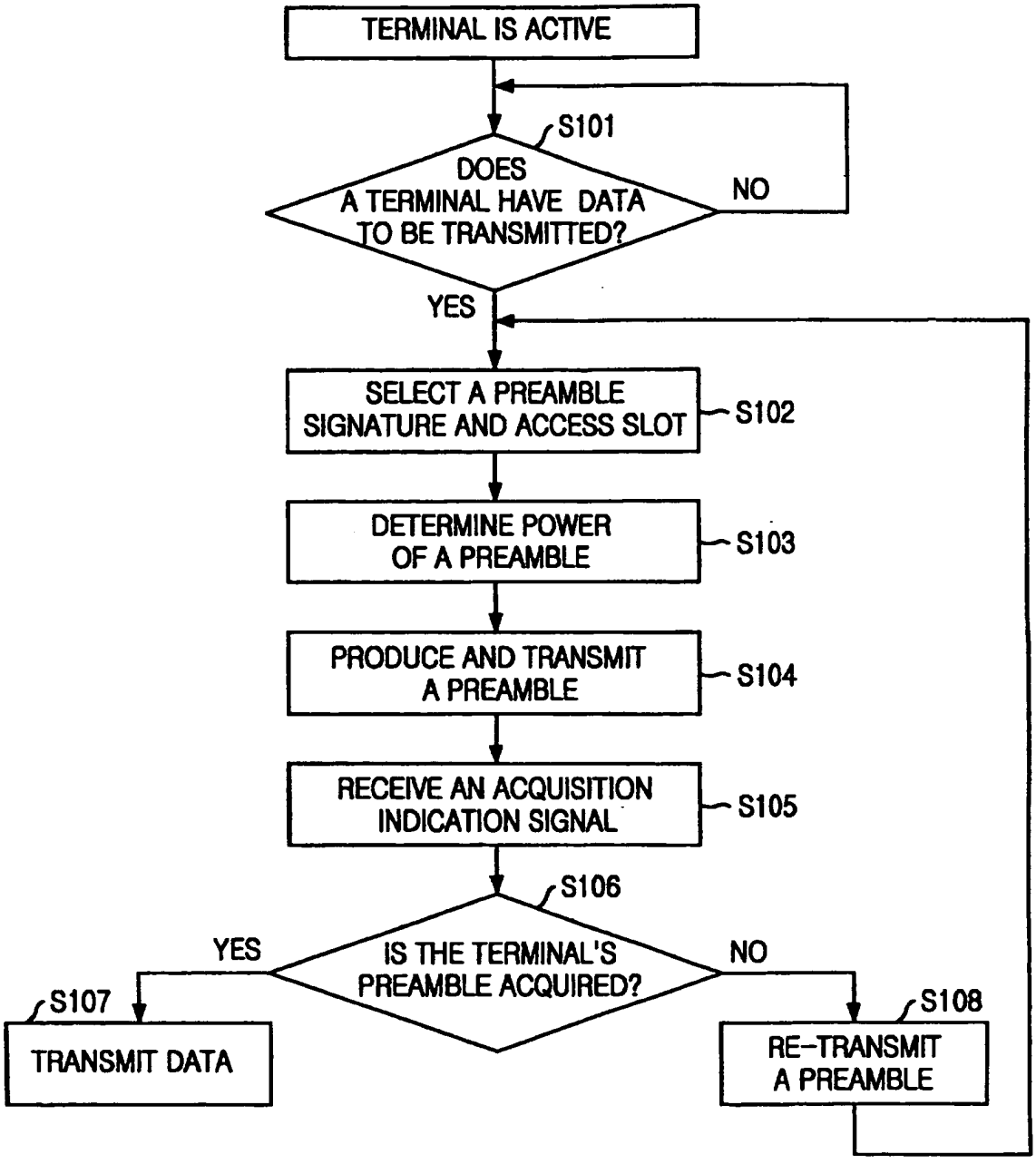
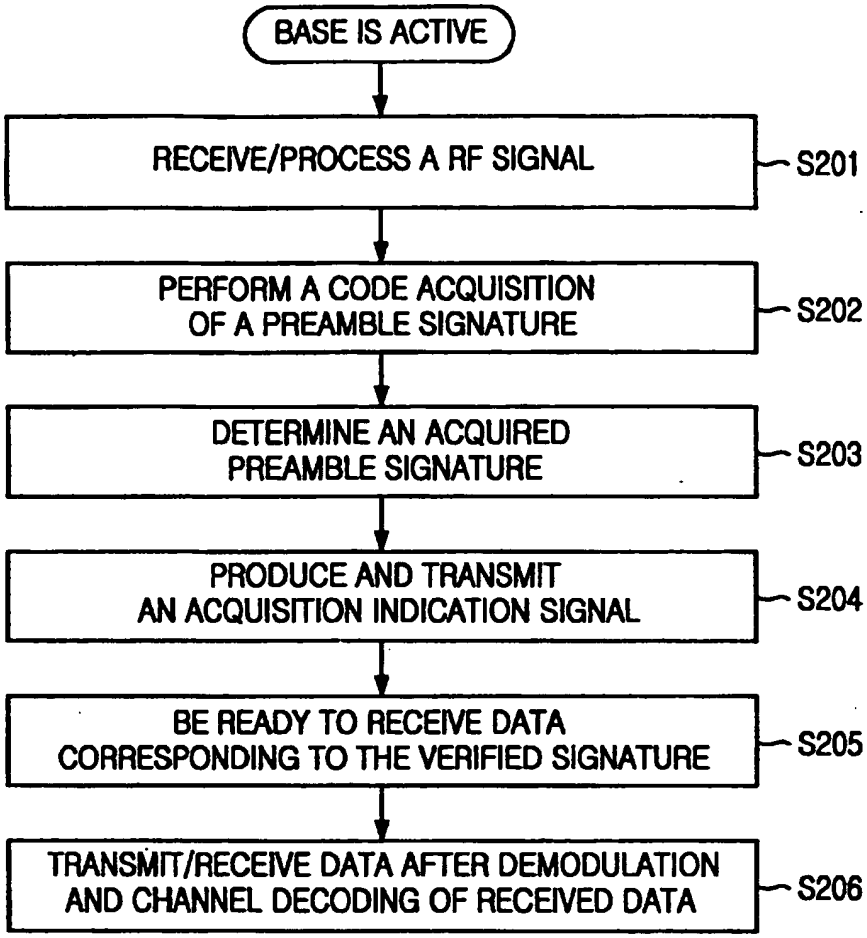

TERMINAL IS ACTIVE
S101
DOES A TERMINAL HAVE DATA TO BE TRANSMITTED?
NO
YES
SELECT A PREAMBLE SIGNATURE AND ACCESS SLOT
S102
DETERMINE POWER OF A PREAMBLE
S103
PRODUCE AND TRANSMIT A PREAMBLE
S104
RECEIVE AN ACQUISITION INDICATION SIGNAL
S105
S106
IS THE TERMINAL'S PREAMBLE ACQUIRED?
YES
NO
S107
TRANSMIT DATA
S108
RE-TRANSMIT A PREAMBLE

FIG. 6


BASE IS ACTIVE
RECEIVE/PROCESS A RF SIGNAL
S201
PERFORM A CODE ACQUISITION OF A PREAMBLE SIGNATURE
S202
DETERMINE AN ACQUIRED PREAMBLE SIGNATURE
S203
PRODUCE AND TRANSMIT AN ACQUISITION INDICATION SIGNAL
S204
BE READY TO RECEIVE DATA CORRESPONDING TO THE VERIFIED SIGNATURE
S205
TRANSMIT/RECEIVE DATA AFTER DEMODULATION AND CHANNEL DECODING OF RECEIVED DATA
S206

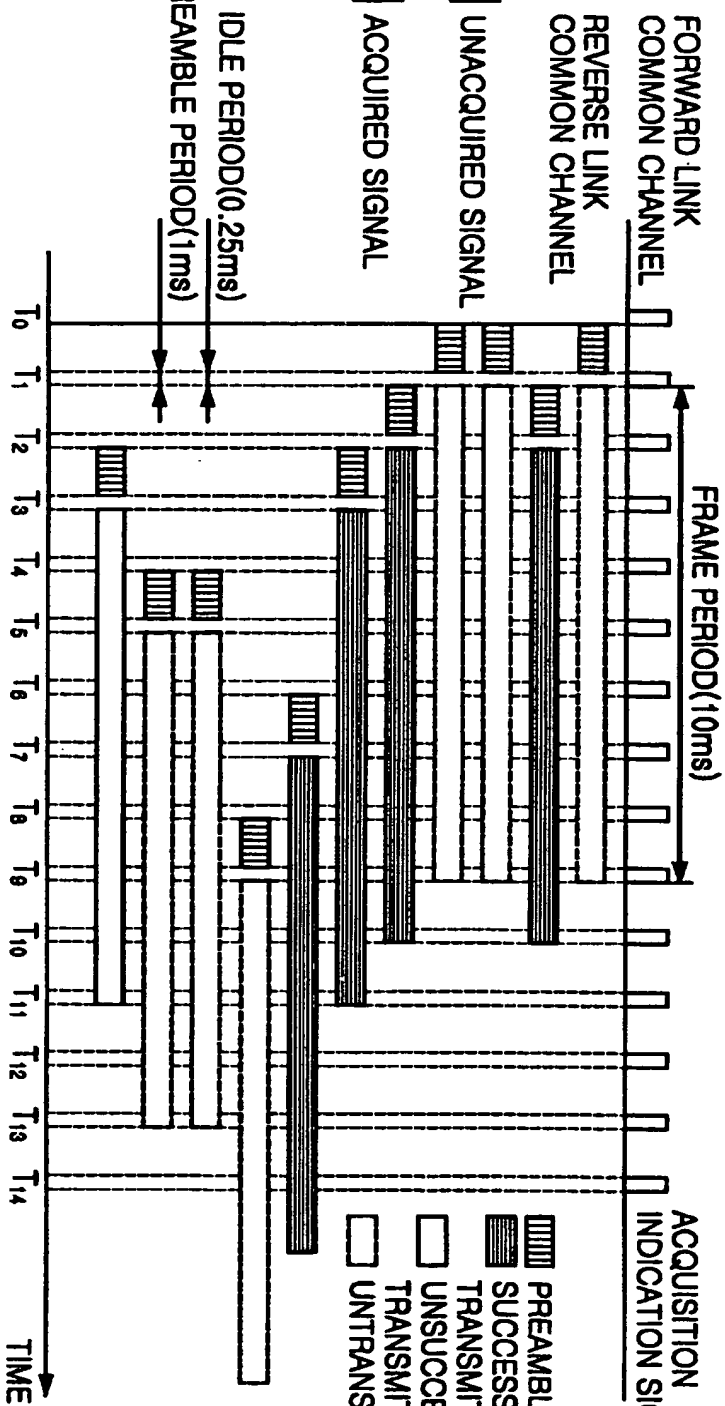

FORWARD LINK COMMON CHANNEL
REVERSE LINK COMMON CHANNEL
UNACQUIRED SIGNAL
ACQUIRED SIGNAL
IDLE PERIOD(0.25ms)
PREAMBLE PERIOD(1ms)
FRAME PERIOD(10ms)
ACQUISITION INDICATION SIGNAL
PREAMBLE
SUCCESSFUL TRANSMITTED DATA
UNSUCCESSFUL TRANSMITTED DATA
UNTRANSMITTED DATA
T0 T1 T2 T3 T4 T5 T6 T7 T8 T9 T10 T11 T12 T13 T14
TIME

FIG. 7

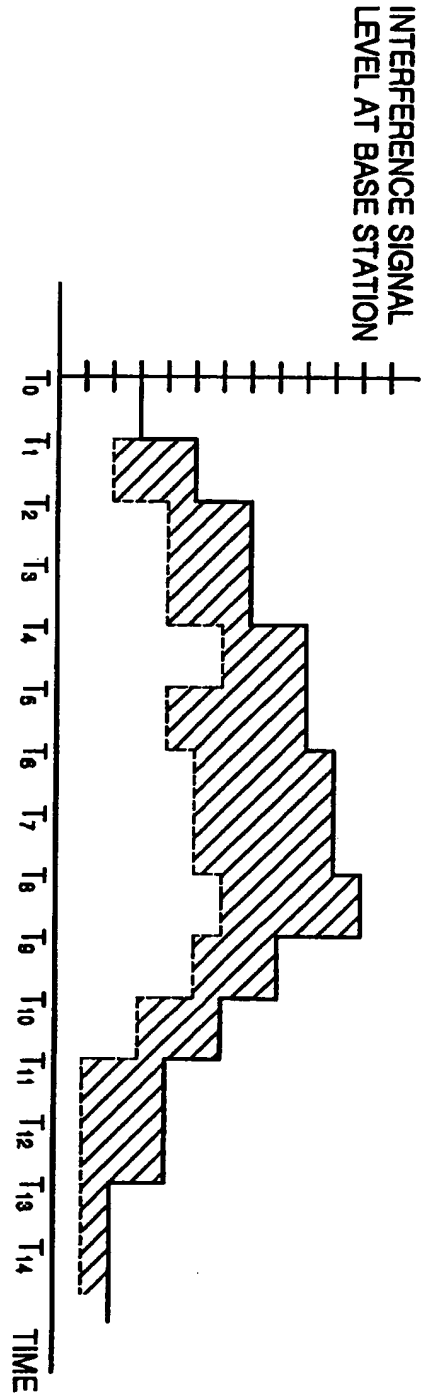

INTERFERENCE SIGNAL
LEVEL AT BASE STATION
T0
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
T13
T14
TIME

FIG. 8

APPARATUS AND METHOD FOR RANDOM ACCESS VIA REVERSE LINK COMMON CHANNEL IN CODE DIVISION MULTIPLE ACCESS

BACKGROUND OF THE INVENTION

The invention relates to an apparatus and method for random access in which multiple terminals transmit data via a common channel in code division multiple access method, more particularly, to an apparatus and method for random access in which terminals select one of available preamble signatures and one of available access slots and transmit a preamble, a base station tries to acquire the preamble and broadcasts to all terminals whether the preamble are acquired or not, and the terminals transmit a data or retransmit a preamble according to the result of the preamble acquirement. The apparatus and method have an improved efficiency of a network by reducing unnecessary data transmission and interference signal and an improved time delay characteristic by re-transmitting preamble-by-preamble and ramping to adequate power level more quickly.

Nowadays, the demand for a mobile communication service is rapidly increasing, the service can transmit voice information during moving, but it cannot support data service. However, there is an increasing demand for simple data such as E-mail to an image data in moving. Particularly, there are studies of International Mobile Telecommunication-2000 (IMT-2000) for the third mobile communication capable of providing services to anywhere in the world through an international unified standard with supporting not only voice information but also a moving image. For example, in a wireless LAN

represented in IEEE 802.11 standard, the products capable of transmitting 2Mbps(Mega bit per sec) data are commonly used.

In general, since an existing public switched telecommunication network (PSTN) or a circuit switch method used to a digital cellular and a personal communication system use a finite channel inefficiently, they are not suitable to the data transmission. Thus, in a local area network (LAN) or an IMT-2000 system on study as a standard of the next generation mobile communication system, a packet switch method is adapted to solve the disadvantage of the circuit switch method and to transmit data with variable rates.

On the other hand, a spread spectrum method, a signaling method of a code division multiple access (CDMA) applied in a current digital cellular system, has advantages of increased acceptance capacity, impossibility of tapping from outside, stable communication even in multipath environments occurred by a changing wireless channel.

Now, supporting both existing voice information and packet data is requested in IMT-2000 system whose standardizing is being processed, however, the method using an dedicated channel as in a conventional voice service cannot use a source inefficiently because of the non-periodic characteristic of packet data. Namely, while a continuous occurring data such as voice information uses an assigned dedicated channel, a discontinuous packet data whose rates are variable decreases the system capacity when the dedicated channels are used.

Thus, when a proper number of reverse link channels are used in common, a source is used efficiently and services with variable rates as well as voice service can be accepted simultaneously to the extent of the system capacity. Further, it is expected that the number of

subscribers is increased and a quantity of data to be transmitted is increased, so an efficient usage of a source using a reverse link common channel will be required.

An ALOHA method of the methods for channel access and data transmission using the reverse link common channel is known as the most simple method. The ALOHA method is a typical random access method, was developed as a protocol for a wireless network between islands of Hawaii sates at Hawaii University in 1970. However, in the ALOHA method, as data is transmitted without a particular time schedule between a base station and a terminal, an efficiency of data transmission decreases. And, overloads mat be occurred in being lots of terminals, because collapses between transmitting data become to increase. A slotted ALOHA with specific times between a base station and a terminal has been studied to solve the problems. The slotted ALOHA is a method that a data transmission is allowed at only the specific time even a data to be transmitted being occurred at a terminal, so an efficiency of data transmission is increased, because a possibility which its data transmission is interfered by data occurred at another terminal is decreased, and on the whole, the efficiency of a network is improved.

FIG.1 is a diagram showing data transmission in an ALOHA protocol using a prior code division multiple access method.

According to Fig.1, a terminal transmits data through one access attempt, the access attempt is consisted of multiple access sub-attempts, the access sub-attempt is consisted of multiple access probe sequences, and the access probe sequence is consisted of multiple access probes.

The access probe is consisted of a preamble which is transmitted

in forms of simple pilots before the transmission of an access channel message or user data for acquisition of a terminal timing, and an access message capsule comprising access information or a user data.

When a terminal transmits an access message or data to a reverse link common channel through the access attempt processing as described above, first, it transmits an access probe in predetermined power level. The power is an adequate level not only to reduce an interference effect affecting other terminals transmitting data by using a dedicated channel or via another reverse link common channel but also to reduce the processing time through the decreased number of retransmissions.

A terminal attempting a first access probe data transmission monitors the indication whether the access probe is detected or not from a base station within a certain time (TA). But, if a data transmission of the first access probe fails, the terminal attempts in more increased power level by a predetermined level (PI) than that of the first access probe after an waiting random time (RT).

The terminal continuously attempts the access prove including a data transmission through the above processing. However, if the data transmission is not successful within a predetermined number of access probes, after completing one access probe sequence and waiting a random time (RS), a terminal restarts a second access probe sequence such as the first access probe.

However, since the ALOHA method basically transmits data with the inadequate power level in a contention mode, failure of access probe is inevitably occurred due to insufficient power level and collision between transmitted data, resulting in a wasteful transmission in failure.

There is a method using multiple preamble signatures for improving an acquirement possibility of a preamble. The preamble signature is a sequence composed of multiple symbols for modulating a common spreading code used in a preamble for a reverse link common channel. Since orthogonality is maintained between preambles, base station can acquire simultaneously the multiple preambles with different preamble signature.

While a preamble is a signal for obtaining a synchronization of a reverse link common channel, the longer preamble can acquire more stable synchronization but is not efficient in terms of transmission efficiency.

SUMMARY OF THE INVENTION

An object of the present invention is to solve the above problems, provide an apparatus and method for random access having an improved efficiency of a network by reducing unnecessary data transmission and interference signal and an improved time delay characteristic by retransmitting preamble-by-preamble and ramping to adequate power level more quickly in which terminals select one of available preamble signatures and one of available access slots and transmit a preamble, a base station tries to acquire the preamble and broadcasts to all terminals whether the preamble are acquired or not, and the terminals transmit a data or retransmit a preamble according to the result of the preamble acquirement.

According to the present invention, when a terminal transmits a modulated preamble with a preamble signature, it selects randomly one

preamble signature from a subset of a preamble signature classified according to traffic characteristics to run a various packet data efficiently. Also, after a base station performs acquisition of the preamble for all available preamble signatures, it informs the acquired preamble signature to all terminals via a forward link common channel. Then, the terminal verifies whether own transmitted preamble is acquired or not, if the preamble is acquired, the terminal transmits user information data at the predefined time with adequately estimated power level by the power level in transmitting the preamble. Otherwise, the terminal randomly selects an access time and a preamble signature, determines increased power level by the predefined power step, compared power level of a prior preamble, and re-transmits a preamble.

BRIEF DESCRIPTION OF THE DRAWING

The object, features and advantages of the present invention are understood within the context of the description of the preferred embodiment as set forth below. The description of the preferred embodiment is understood within the context of accompanying drawing. Which form a material part of this disclosure, wherein:

Fig. 1 is a diagram showing a data transmission of ALOHA using a reverse link common channel in a code division multiple access method according to prior art;

Fig. 2 is a configuration diagram of a network for applying the present invention;

Fig. 3A is a functional block diagram of a terminal and a base station at an apparatus for random access of a reverse link common

channel in a code division multiple access method according to the present invention;

Fig. 3B is a block diagram of a terminal first determiner of Fig. 3A;

Fig.4 is a schematic diagram illustrating operations between a base station and a terminal of an apparatus according to the present invention;

Fig.5 is a flow chart of access of a terminal to according to the present invention;

Fig. 6 is a flow chart of access of a base station to according to the present invention;

Fig. 7 is a diagram showing an example operation of an apparatus of reverse link common channel in a code division multiple access method according to the present invention;

Fig. 8 is a diagram showing an example of an interference signal level of an apparatus of reverse link common channel in a code division multiple access method according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

To accomplish the propose, the present invention provides an apparatus for random access in which multiple terminals transmit data to a base station via reverse link common channel using a code division multiple access, in which the base station performs acquisition of a preamble transmitted from the multiple terminals via a reverse link common channel for all available preamble signatures, and transmits a signal indicating whether the preamble signature transmitted from the

multiple terminals are acquired or not to the terminals via a forward link common channel; and the multiple terminals randomly select the preamble signature classified by the characteristics of data to transmit and modulate the preamble, receive the signal indicating acquisition indication transmitted from the base station via the forward link common channel. If the preamble is acquired, the terminal transmits user information data at the predefined time with adequately estimated power level by the power level in transmitting the preamble, otherwise, re-transmit a preamble with randomly selected preamble signature at an access slot.

The description of the preferred embodiment as set forth below.

Fig. 2 is a configuration diagram of a network for applying the present invention.

The network comprises a terminal 100 for generating data and transmitting a preamble(s) the data via a reverse link common channel, a base station 200 for performing a code acquisition using the preamble transmitted from the terminal 100 via a reverse link common channel, indicating to the terminal 100 whether the preamble is acquired or not, receiving user information data corresponding to a terminal, and interfacing to higher layer protocol; a CDMA network 300 for managing the multiple base stations 200 and 210 and performing interface with other networks; a public switched telephone network(PSTN) 400 connected with the CDMA network 300 for connecting the terminal 100 with a usual wired telephone subscriber; a Internet 500 connected with the CDMA network 300 for connecting the terminal 100 with an Internet; and a public switched data network(PSDN) 600 connected with the CDMA network 300 for connecting the terminal 100 with the data server

supported with a data service.

An apparatus for random access of a reverse link common channel according to the present invention in the network further comprises a transmitting means of the acquisition indication signal in a base station, a receiving means of the acquisition indication signal and a determining means for transmission in a terminal. The transmitting means in the base station transmits an acquisition indication signal indicating to all terminals whether the transmitted preamble signature is acquired, after a code acquisition of a preamble is performed for all available preamble signatures via a reverse link common channel. The receiving means in the terminal receives the acquisition indication signal from the base station via forward link common channel. And the determining means determines whether the user information data should be transmitted or preamble should be transmitted again according to the acquisition indication signal. If the preamble signature is indicated as be acquired, the terminal transmits the user information data, otherwise, it transmits again a preamble with a randomly selected preamble signature and increased power level at a newly selected access slot.

Fig. 3A is a functional block diagram of a terminal and a base station at an apparatus for random access of reverse link common channel in a code division multiple access method according to the present invention.

The terminal 100 comprises a terminal first determiner 110 for randomly selecting a preamble signature out of available preamble signature classified according to a traffic characteristics and an access slot to be transmitted, and determining power level of the

preamble using forward like path loss, interference signal level informed from the base station; a terminal first transmitter 120 for transmitting a preamble with the determined preamble signature and power level at the selected access slot in the terminal first determiner 110; a terminal first processor 170 being active by the terminal first determiner 110 for formatting an user information data to transmit; a terminal second transmitter 180 for receiving the formatted user information signal from the terminal first processor 170, spreading and outputting the signal with the channelization code corresponding to the preamble signature; a terminal selector 130 for selecting either the produced data at the terminal second transmitter 180 or the produced preamble at the terminal first transmitter 120 according to the acquisition indication signal transmitted from the base station 200; a terminal second processor 140 for converting the selected signal at the terminal selector 130 into a RF signal and transmitting it to the base station 200 via a wireless channel, and converting acquisition indication signal in RF signal transmitted from the base station 200 into a baseband signal; a terminal receiver 150 for receiving the acquisition indication signal of baseband from the terminal second processor 140 and verifying whether the transmitted preamble signature is acquired or not; and a terminal second determiner 160 for enabling and disabling the terminal first determiner 110 according to the result verified at the terminal receiver 150, and outputting a signal for switching a switch of the terminal selector 130.

As described Fig. 3B, the terminal first determiner 110 comprises a signature storage 111 for receiving and storing information about

preamble signature set classified by a characteristic of traffic transmitted from the base station via a forward link common channel; a signature selector 112 for classifying the generated data considering traffic characteristics and a request conditions from upper layer, and randomly selecting a preamble signature of the available preamble signatures corresponding to the traffic characteristic; a slot selector 113 for randomly or deterministically selecting an access slot when the preamble is transmitted; and power determiner 114 for determining power of a transmission preamble considering interference signal level of the base station, forward link path loss, and power level of the preamble transmitted previously.

The power determiner 114 is configured to determine power level considering an interference signal level of the base station transmitted from the base station via a forward link common channel, forward link path loss, pre-defined power increasing step, and power level of the preamble transmitted previously.

The terminal first transmitter 120 transmits the preamble by using the access slot, preamble signature, and power level determined at the terminal first determiner 110 and by modulating the common spreading code by the preamble signature, and produces a complex spreading signal whose real value is the same as the imaginary one, using the selected preamble signature and common spreading code.

The terminal receiver 150 receives an acquisition indication signal using the same signature as the transmitted preamble signature and a code used for acquisition indication transmission in forward link.

Also, the terminal second determiner 160 enables the terminal

first determiner 110 and outputs a signal for connecting the output of the terminal first transmitter 120 to the terminal selector 130, if acquisition indication signal indicates an acquisition of the transmitted preamble signature; otherwise, the determiner 160 disables the terminal first determiner 110, and connects the output of the terminal second transmitter 180 to the terminal selector 130.

The base station 200 comprises a base processor 210 for receiving a RF signal transmitted from the terminal 100, and transmitting a RF signal to the terminal 100; a base synchronizer 220 for receiving a preamble transmitted from the terminal 100 via a reverse link common channel from the base processor 210, and performing acquisition of the preamble with all available preamble signatures; a base determiner 230 for verifying the acquisition, and determining and outputting the acquired preamble signatures; a base transmitter 240 for producing multiple acquisition indication signals corresponding to the acquired preamble signatures inputted from the base determiner 230, and outputting the signal to the terminal 100 via the base processor 210; and a base transceiver 250 for receiving time delay information of multiple path obtained from the base synchronizer 220, producing a reverse spreading code by using the information about the acquired preamble signature received from the base determiner 230, receiving the data transmitted from the terminal 100 via the reverse link common channel from the base processor 210, and receiving the data processed through modulation and channel demodulation.

The base synchronizer 220 comprises a synchronizer for receiving the preamble transmitted from the terminal 100 via the reverse link common channel from the base processor 210, and performing acquisition

for preambles with all available preamble signatures; a outputting unit of a characteristic of time delay for making all of the base transceiver 250 identify a characteristic of time delay corresponding to the acquired preamble signature, and making the base transceiver 250 be ready to receive a data to be transmitted at pre-defined time if any; and a outputting unit of acquisition indication signal for informing to the base determiner 230 preamble signatures are acquired.

The base determiner 230 comprises a generator of a spread spectrum signal for informing a spreading code corresponding to the preamble signature inputted from the base synchronizer 220 to the base transceiver 250 and making the base transceiver 250 be ready to receive a data to be transmitted at pre-defined time if any, and a generator of an acquisition indication signals for producing acquisition indication signals corresponding to only the acquired preambles and outputting the signals to the base transmitter 240.

The base transmitter 240 is configured to transmit the acquisition indication signal based on one of signal formats comprising: an on-off signal format #1 for dividing the available times into the number of available signatures, assigning each divided time to each available preamble signature, transmitting acquisition indication signals only on the divided times assigned to the acquired preamble signatures, and transmitting no acquisition indication signal on the divided times assigned to the non-acquired preamble signatures; an antipodal signal format #2 for dividing the available times into the number of available signatures, assigning each divided time to each available preamble signature, and transmitting positive acquisition indication signals for acquired preamble signatures and

negative acquisition indication signals for non-acquired preamble signatures on all the divided times assigned to the available preamble signatures; an on-off signal format #3 for assigning an orthogonal code to a preamble signature and setting it as a symbol to be transmitted, and transmitting only orthogonal code corresponding to the acquired preamble signature; and an antipodal signal format #4 for assigning a orthogonal code to the preamble signature and setting it as a symbol, transmitting positive acquisition indication signals for acquired preamble signatures and negative acquisition indication signals for non-acquired preamble signatures with all orthogonal codes assigned to the available preamble signatures. Also the additional signal formats can be used by combining the four signal formats in hybrid.

The transmission system of the acquisition indication signal selects and transmits one of methods comprising a puncturing method applied to a prior forward link common channel, a method using a code orthogonal to another forward link common channel, and a method using a code non-orthogonal to another forward link common channel.

Also, the base station 200 distinguishes characteristics of data to be transmitted via an reverse link common channel into a packet access for transmitting a short data, a channel reservation request for transmitting a medium data, and a channel request requesting an dedicated channel assignment for transmitting a large and continuous data such as voice data. And, the base station 200 classifies all of available preamble signatures according to characteristics of data to be transmitted, broadcasts it via a forward link common channel for all terminals to identify it.

To access the packet to the base station 200, the terminal 100

transmits a preamble with one of preamble signatures classified by a characteristics of data through a packet access such as its length and a transmission rate, reviews its acquisition indication transmitted from the base station 200 and determines whether it re-transmits a preamble or transmits an user information data. If it is determined that the user information data is transmitted, the terminal 100 continuously transmits one or multiple frame matched to frame structure, and re-performs an operation for a packet access with regard to failed frames of the transmitted frames.

For the channel reservation request, the terminal 100 randomly selects one of the preamble signatures assigned for a channel reservation request and transmits a preamble same as the packet access, and the base station 200 performs acquisition of the preamble transmitted from the terminal 100 and informs to all terminals via a forward link common channel which preambles are acquired. When no or negative acquisition indication is indicated to the terminal 100, it selects randomly one of the preamble signatures assigned for a channel reservation, determines an access slot, and re-transmits a preamble. Otherwise, when the terminal 100 transmits the preamble whose signature is acquired, it transmits the user information data for reservation request and attempts a channel reservation by transmitting a data for channel reservation. And, the base station 200 informs a channel reservation-or-not, reserved time and a spreading code, and transmission rate to corresponding terminals by using a forward link common channel, after exactly receiving the transmitted data for channel reservation from a terminal. Then, the corresponding terminals transmit date to be transmitted using the reserved time, the

spread code, and the transmission rate, perform a closed loop power control using a power control instruction to be transmitted to a forward link channel, and transmit information indicating a completion of data transmission with data in transmitting a final frame and cancel the reservation.

To change a channel reservation condition during the reservation, it is one method that the terminal 100 transmits data for changing the channel reservation condition with transmitting data in the same operation for the packet access and the channel reservation request. The other method is that the terminal 100 multiplexs data for changing the channel reservation conditions with the user information data and then transmits it. In both methods, the base station 200 should transmit an information relating to acceptance or rejection.

We will describe an operation of an apparatus of an reverse link common channel in a code division multiple access method according to the invention.

Fig.4 is a schematic diagram illustrating operations between a base station and a terminal of an apparatus according to the present invention.

As described Fig. 4, once a data to be transmitted is occurred, a terminal 100 transmits a preamble to a base station 200, and the base station 200 performs preamble code acquisition and transmits an acquisition indication signal of the preamble code acquisition to all the terminals 100. According to that, each terminal 100 monitors the acquisition indication signals, and when the transmitted preamble is not acquired, the terminal 100 re-transmits a preamble; otherwise, it transmits an user information data. Then, the base station 200

receiving data transmits acknowledgment signal of the user information data to the terminal 100 after receiving and error checking the user information data. The time for not acquiring the preamble is called as idle time (IT).

The terminal operation is described in Fig. 5. As described Fig. 5, when a data to be transmitted is generated (S101), the terminal 100 selects one of available preamble signatures corresponding to the traffic characteristics and an access slot to transmit a preamble (S102), and performs a determining step (S103) that determines power level of a transmission preamble using forward link path loss, an information about interference signal level transmitted from a base station 200. Then, the terminal 100 produces and transmit a preamble with the randomly selected preamble signature and the determined power level, at the randomly selected access slot (S104).

After that, the terminal 100 receives an acquisition indication signal of the preamble broadcast from the base station 200 to all terminals 100 (S105) and verifies whether the own transmitted preamble signature is acquired or not (S106).

If the transmitted preamble is acquired in the step of receiving the acquisition indication signal, the terminal 100 formats the user information data to a pre-defined form, performs a data transmission step for selecting message or preamble, spreading by specific spreading code corresponding to the preamble signature, and transmitting it (S107). However, If the transmitted preamble is not acquired in step of receiving the acquisition indication signal, the terminal 100 performs a re-transmission step for repeating the steps starting from the determining step of transmission sources such as

preamble signature, access slot and the power level, and re-transmitting preamble (S108).

In other hand, as described Fig. 6, the base station 200 controls the transmission of the preamble acquisition indication signal. First, the base station 200 receives RF signal from the terminal (S201), and performs preamble code acquisition step of trying to acquire the synchronization for the preambles with all available preamble signatures (S202).

Then, the base station 200 verifies whether or which preambles are acquired or not and determines acquired preamble signature (S203), produces a acquisition indication signals corresponding to the acquired preamble signature, and transmits the signal to all the terminals (S204).

Then, the base station 200 obtains time delay and fading phase information of the estimated multiple path obtained at the preamble code acquisition, produces an spreading code using the information of the acquired preamble signature and is ready to receive (S205). And the base station 200 receives the data transmitted from the terminal via a reverse link common channel, and receives the user information data through demodulation and channel decoding (S206).

We will describe the operations more particularly. When a terminal first determiner 110 is enabled from outside, the terminal first determiner 110 randomly selects one preamble signature of a set of preamble signatures classified by a characteristic of data to be transmitted, and, at the same time, randomly selects an access slot. Then, a terminal first transmitter 120 spreads the preamble signature using a common spreading code, produces a preamble to be transmitted

and transmits it at the selected transmission slot. At this moment, a terminal selector 130 is connected to the terminal first transmitter 120, outputs the preamble to a terminal second processor 140, and transmits it to the base station 200.

Accordingly, in the base station 200, a base station processor 210 receives the preamble transmitted from the terminal 100 and outputs the preamble to a base synchronizer 220. The base synchronizer 220 performs preamble code acquisition with all of the available preamble signatures, and outputs the information for acquisition or not to a base determiner 230. Then, the base determiner 230 receives the information about each preamble signature from the base synchronizer 220 and determines the acquired preamble signatures, then outputs it to the base transmitter 240 and the base transceiver 250. The base transmitter 240 receives acquired preamble signature, produces a signal corresponding to the acquired preamble signature and outputs the signal to the terminal 100 using a forward link common channel via the base processor 210. At the same time, the base transceiver 250 receives the acquired preamble signatures from the base determiner 230 and is ready to receive the data transmitted from the terminal 100 using the spreading codes corresponding to the acquired preamble signature.

On the other hand, the terminal receiver 150 receives the acquisition indication signal transmitted from the base station 200 via a forward link common channel through the terminal second processor 140, verifies whether the transmitted preamble is acquired or not, and outputs the result of the verifying to the terminal second determiner 160.

At this time, if the terminal second transmitter 160 verifies an

successful acquisition of the transmitted preamble, the determiner 160 disables the terminal first determiner 110 and the terminal first transmitter 120, and the terminal second transmitter 180 spreads the user information data formatted by the terminal first processor 170 with a spreading corresponding to the transmitted preamble signature, and outputs the signal to the terminal selector 130. Then, the terminal selector 130 receives an acquisition indication signal of a preamble signature from the terminal second determiner 160, closes a switch to the output of the terminal second transmitter 170, and transmits the signal to the base station 200 via the terminal second processor 140. Then, the transmitted data is inputted to the base transceiver 250 via the base processor 210, and the base transceiver 250 retrieves a data through a demodulation and decoding process using a pre-defined spreading code via an reverse link common channel.

On the other hand, if the terminal second determiner 160 verifies non-acquisition of the transmitted preamble, the terminal first determiner 110 and the terminal first transmitter 120 are enabled. Namely, the terminal first determiner 110 randomly re-selects one of a set of preamble signatures, at the same time, randomly or deterministically selects an access slot.

As above transmission of the initial preamble, the terminal first transmitter 120 spreads the determined preamble signature using a common spreading code and produces a preamble to be transmitted, then transmits the preamble at the selected access slot. And, the terminal selector 130 is connected to the terminal first transmitter 120, outputs the preamble to the terminal second processor 140 and transmits the preamble to the base station 200.

And, the said operations are repeated by the limited number of repetition, which is a system parameter dependent on the system loads, balances of the traffics to be served and other system conditions.

Fig. 7 is a diagram showing an example operation of an apparatus of reverse link common channel in a code division multiple access method according to the present invention.

As described Fig. 7, first, we assume that a frame period is 10[ms], one slot is 1.25[ms], one frame period has 8 access slots and a preamble occupies 1[ms]. Thus, an access slot consists of a preamble duration of 1ms length and idle time of 0.25[ms]. There is also the access slot at the base station 200, composed of acquisition indication signal duration of 1ms length and idle time of 0.25[ms].

Also, we consider an example of 2 preamble signature and a short data available within one frame duration for a simple explanation.

It is assumed that three of terminals having a data to transmit at prior to a first access slot starting point (To) randomly select any preamble signatures and the same access slot. However, no preamble is acquired in the base station 200, since there is no preamble with the sufficient power level.

At this moment, the base station 200 transmits only negative acquisition indication signal in the signal format #2 and #4, while non-acquisition indication signal in the signal format #1 and #3. Therefore, each terminal should re-transmit each preamble with randomly selected preamble signature and the increased power level at randomly selected or pre-defined access slot.

When terminals determine sufficient power level through an open loop power control and transmit each preamble with a different preamble

signature at the next access slot T1, all of the two preambles are acquired successfully and positive or on-acquisition indication signal are received to all terminals. Thus, the terminals transmit each user information data for 10[ms] length at an access slot T2. Of course, the access time for data transmission can be extended to T3 or T4.

At the time slot T2, there is a case that two terminals transmit preambles with same preamble signature and the base station successfully acquires the preamble code synchronization. So two terminals receive positive or on acquisition indication signal corresponding to own preamble signature and transmit their user information data at the pre-defined time. In the case, if all the power levels of the acquired preambles are enough to perform the preamble code acquisition in the base station, the base station can't receive any user information data successfully since the receiver combine the multipath signals from different user information data. However, if only one preamble has sufficient power level to the receiver and the other not, the receiver in the base station will combine the multipath signals from only one user information data with sufficient power level, then it is probably that it demodulates and decodes the user information data successfully.

Fig. 8 is a diagram showing an example of an interference signal level of an apparatus of reverse link common channel in a code division multiple access method according to the present invention.

In the Fig. 8, a solid line indicates interference signal level of an apparatus for random access of a prior reverse link common channel, a dot line indicates interference signal level of an apparatus for random access of an reverse link common channel according to the

present invention, and oblique part indicates decreasing quantity of an interference signal level of an apparatus according to the present invention compared with a prior art.

As described Fig. 8, the apparatus for random access of a reverse link common channel according to the present invention reduces an interference signal level and increases an entire acceptance capacity by suppressing a transmission of lots of wasteful data, minimizes an effect affecting users using another channel, and transmits a data more quickly due to re-transmission preamble-by-preamble.

Hereafter, we will describe a service of transmission of a short data having a variable length by using an operation similar to the above operation. Since an dedicated channel or a reservation request is needed in case of a data length exceeding a predetermined level, a length of data which is accommodated by the random access method will be limited to several times of frame unit. Also the kinds of data which can be accommodated by the random access method are also limited.

For example, if the random access method can accommodate the data with length up to 4 times of frame, the terminal should request a dedicated channel assignment or reservation channel for data whose length exceeds 4 times of frame.

At that time, first, a base station classifies preamble signature assigned for a packet access by data lengths and informs it to all terminals. The classification makes it easy to allocate preamble signatures dynamically considering balances of traffics with to different data lengths.

And, when the terminals transmit data using a reverse link common channel, they determine a characteristic of data traffic such as a

length and a transmission rate of a transmission data. If terminals transmit a data through random access method and apparatus according to the present invention, they transmit a preamble with preamble signatures and then transmit the message signal including the data according to the acquisition indication. If terminals transmit a data through a dedicated channel or reservation channel, they transmit a preamble with preamble signatures and then transmit the message signal requesting a dedicated channel or reservation channel according to the acquisition indication signal. For example, if terminals transmit 40[ms] data through random access method and apparatus, they transmit a preamble with one of the preamble signature assigned for 40[ms] data, and configure four 10ms frames and transmit the frames continuously. And, if the one of continuously transmitted frames fails to be transmitted, only one is re-transmitted. At that time, terminals can select a new preamble signature assigned for characteristics of data to re-transmit in same manner of the above method and transmit a preamble and message signal.

Then, we will describe an operation requesting a channel reservation using a reverse link common channel, when a terminal needs to reserve a channel in temporary for transmitting a middle length of data.

First, the terminal 100 transmits information for requesting channel reservation and an identification number of the terminal through the random access according to the present invention. When the terminal 100 transmits the random access, it selects one of the preamble signatures assigned for a channel reservation and transmits a preamble, and receives an acquisition indication signal of preamble

code acquisition from the base station 200 and transmits the data requesting a channel reservation. Since the data for a channel reservation can generally be accommodated in a frame, the terminal 100 transmits after receiving positive acquisition or on-acquisition from the base station 200. So the base station finds out the required data length for a channel reservation and inform the terminal 100 the status of reservation request.

That is, once the base station 200 exactly receives the data for a channel reservation, it informs channel reservation-or-not, reserved time, and spreading code, and allowable maximum transmission rate to the corresponding terminals, and the receiving terminals transmit a data within the allowable maximum transmission rate using the spreading code at the reserved time. The base station 200 transmits a power control command signal using a forward link common or dedicated channel to a reserved terminal, then performs a closed loop power control.

When a terminal intend to change channel reservation conditions during a channel reservation, it transmits data about channel reservation conditions to change in the same method as the method transmitting a preamble for initial channel reservation. Also it is possible to multiplex the data about channel reservation conditions to change with the current messages to transmit when the current transmission rate is less than the allowable maximum transmission rate. And, when the channel reservation are completed, the terminal piggybacks the completion information in a pre-defined field of the last and transmits it to the base station 200. Then, the base station 200 releases the reserved channel and time and informs it to all the

terminals.

The method of channel-reservation of the data in medium length will be used to an application area such as pack voice service to be serviced.

On the other hand, when a transmission data is long and a dedicated channel is requested to service a voice signal, a method being similar to that used in a channel reservation request is used. First, a terminal randomly selects one of the preamble signatures assigned for a dedicated channel request and transmits a preamble, receives an acquisition indication signal of preamble code acquisition from the base station 200 and transmits a data for a dedicated channel request. Then, the terminal transmits and receives the data using the dedicated channel after being informed an assignment-or-not of a dedicated channel and a spreading code from the base station 200. As different with above the channel reservation request, a terminal can transmits a data without a limit of a frame length, and a closed loop power control can be easily realized because one or more dedicated channels are assigned to both of an reverse link and forward link direction.

As described above, the present invention is able to use a variable type of a reverse link common channel such as a channel request for a dedicated channel assignment, a packet access for transmitting a short data, a medium data, by classifying the preamble signature according to the characteristics of data.

Also, the invention is able to improve network efficiency by reducing a transmission of wasteful data and interference signals, quickly approach to adequate power level by re-transmitting preamble-by-preamble, and obtain a good characteristic of time delay.

Although a preferred embodiment of the present invention has been illustrated and described, various alternatives, modifications and equivalents may be used. Therefore, the foregoing description should not be taken as limiting the scope of the present invention which is defined by the appended claims.

WHAT IS CLAIMED IS:

1. An apparatus for random access in which multiple terminals transmit data to a base station via reverse link common channel using a code division multiple access,

wherein the base station performs code acquisition of preambles transmitted from the multiple terminals via an reverse link common channel for all of available preamble signatures, and transmits an acquisition indication signal indicating whether the preamble signatures transmitted from the multiple terminals are acquired or not to the multiple terminals via a forward link common channel; and

the multiple terminal select own preamble signatures of preamble signatures assigned to a characteristic of data to transmit, modulate, spread and transmit the preamble to the base station, receive the acquisition indication signal transmitted from the base station via the forward link common channel, and, if the transmitted preamble signature are acquired, the terminals transmit data , if not, the terminals re-transmit a preamble.

2. The apparatus of claim 1, wherein the each terminal comprises:

a terminal first determining means for randomly selecting a preamble signature out of available preamble signatures classified according to a traffic characteristics and an access slot to be transmitted, and determining power level of the preamble using forward link path loss, interference signal level informed from the base station and the power level of the previous preamble if any;

a terminal first transmitting means for producing and

transmitting a preamble with the determined preamble signature and power level at the selected access slot in the first determining mean;

a terminal first processing means being active by the terminal first determining mean for formatting an user information data to transmit;

a terminal second transmitting means for receiving the formatted user information signal from the terminal first processing mean, spreading and outputting the signal with the channelization code corresponding to the preamble signature;

a terminal selecting means for selecting either the produced data at the terminal second transmitting mean or the produced preamble at the terminal first transmitting mean according to the acquisition indication signal transmitted from the base station;

a terminal second processing means for converting the selected signal at the terminal selecting mean into an RF signal and transmitting it to the base station via a wireless channel, and converting an acquisition indication signal in RF signal transmitted from the base station into a baseband signal;

a terminal receiving means for receiving the acquisition indication acquisition of baseband from the terminal second processing mean and verifying whether the transmitted preamble signature is acquired or not; and

a terminal second determining means for enabling and disabling the terminal first determining mean according to the result verified at the terminal receiving mean, and outputting a signal for switching the terminal selecting mean.

3. The apparatus of claim 2, wherein the terminal first determining means comprising:

a signature storing mean for receiving and storing information about preamble signature set classified by a characteristic of traffic transmitted from the base station via a forward link common channel;

a signature selecting means for classifying the generated data considering traffic characteristics and request conditions from upper layer, and randomly selecting a preamble signature of the available preamble signatures corresponding to the traffic characteristic;

an access slot selecting means for randomly or deterministically selecting an access slot when the preamble is transmitted; and

a power determining means for determining power of a transmission preamble considering interference signal level of the base station, forward link path loss, and power level of the preamble transmitted previously.

4. The apparatus of claim 2, wherein the terminal first transmitting means transmits the preamble with the preamble signature and the power level at the transmission slot, in the terminal first determining means and by modulating common spreading code by the preamble signature.

5. The apparatus of claim 4, wherein the terminal first transmitting means produces a complex band spreading signal whose real value is the same as the imaginary one, using the selected preamble signature and common spreading code.

6. The apparatus of claim 2, wherein the terminal receiving means receives the acquisition indication signal using a sequence corresponding to the transmitted preamble signature and a spreading code assigned to the forward link common channel for acquisition indication transmission.

7. The apparatus of claim 2, wherein the terminal second determining means enables the terminal first determining means and outputs a signal for connecting the output of the terminal first transmitting means to the terminal selecting means, if the positive acquisition or on-acquisition indication signal is received; otherwise, the terminal second determining means disables the terminal first determining means, and connects the output of the terminal second transmitting means to the terminal selecting means.

8. The apparatus of claim 1, wherein the base station comprises:

a base processing means for receiving a RF signal transmitted from the terminal, and transmitting an RF signal to the terminal;

a base synchronizing means for receiving a preamble transmitted from the terminal via a reverse link common channel from the base processing mean, and performing acquisition of the preamble with all of available preamble signatures;

a base determining means for verifying the acquisition, determining and outputting the acquired preamble signatures;

a base transmitting means for producing multiple acquisition indication signals corresponding to the acquired preamble signatures inputted from the base determining mean, and outputting the signal to

the terminal via the base processing mean; and

a base transceiving means for receiving time delay information of multiple path obtained from the base synchronizing means, producing an reverse spreading code by using the information about the acquired preamble signature received from the base determining mean, receiving the data transmitted from the terminal via the reverse link common channel from the base processing mean, and receiving the data processed through demodulation and channel decoding.

9. The apparatus of claim 8, wherein the base synchronizing means comprises:

a synchronizing means for receiving the preamble transmitted from the terminal via the reverse link common channel from the base processing mean, and performing acquisition for preambles with all of available preamble signatures;

a outputting means of a characteristic of time delay for making all of the base transceiving mean identify a characteristic of time delay corresponding to the acquired preamble signature, and making the base transceiving mean be ready to receive a data to be transmitted at pre-defined time if any;

a outputting means of acquisition indication signal for informing to the base determining mean what preamble signatures are acquired.

10. The apparatus of claim 8, wherein the base determining means comprises:

a generating means of a spread spectrum signal for informing a

spreading code corresponding to the preamble signature inputted from the base synchronizing mean to the base transceiving mean and making the base transceiving mean be ready to receive a data to be transmitted at pre-defined time if any; and

a generating means of an acquisition indication signal for producing acquisition indication signals corresponding to only the acquired preamble and outputting the signals to the base transmitting mean.

11. The apparatus of claim 8, wherein the base transmitting means transmits on-off signals for dividing the available times into the number of available signatures and assigning each divided time to each available preamble signature, transmitting acquisition indication signals only on the divided times assigned to the acquired preamble signatures, and not transmitting acquisition indication signal on the divided times assigned to the non-acquired preamble signatures.

12. The apparatus of claim 8, wherein the base transmitting means transmits antipodal signals for dividing the available times into the number of available signatures and assigning each divided time to each available preamble signature, transmitting positive acquisition indication signals for acquired preamble signatures and negative acquisition indication signals for non-acquired preamble signatures on all the divided times assigned to the available preamble signatures.

13. The apparatus of claim 8, wherein the base transmitting means transmits on-off signals for assigning an orthogonal code to a preamble

signature and setting it as a symbol to be transmitted, and transmitting only orthogonal code corresponding to the acquired preamble signature.

14. The apparatus of claim 8, wherein the base transmitting means transmits antipodal signals for assigning an orthogonal code to the preamble signature and setting it as a symbol, transmitting positive acquisition indication signals for acquired preamble signatures and negative acquisition indication signals for non-acquired preamble signatures with all orthogonal codes assigned to the available preamble signatures.

15. The apparatus of claim 8, wherein the base transmitting means transmits the any signals such that the acquisition indication signals are orthogonal or antipodal with each other.

16. A method for random access in which multiple terminals transmit data to a base station via a common channel using a code division multiple access, the method performs the steps of:

in the multiple terminal, selecting one of available preamble signatures corresponding to the traffic characteristics and an access slot to transmit a preamble, modulating and transmitting the preamble to the base station;

in the base station, performing preamble code acquisition of the preamble transmitted from the multiple terminals via an reverse link common channel for all of available preamble signatures, transmitting a signal verifying whether or which preambles are acquired or not and

determining acquired preamble signatures, producing a acquisition indication signals corresponding to the acquired preamble signatures, and transmitting the signal to all the terminals via a forward link common channel; and

in the multiple terminals, receiving acquisition indication signal of the preamble broadcasted from the base station to all terminals, and, if the transmitted preamble being acquired, transmitting data, if not, re-transmitting a preamble.

17. The method of claim 16, wherein the each terminal further performs the steps of:

a first determining step for randomly selecting a preamble signature out of available preamble signatures classified according to a traffic characteristics and an access slot, and determining power level of the preamble using forward link path loss, interference signal level informed from the base station and the power level of the previous preamble if any;

a first transmitting step for producing and transmitting a preamble with the determined preamble signature and power level at the selected access slot in the first determining step;

a first processing step being active by the first determining step for formatting an user information data to transmit;

a second transmitting step for receiving the formatted user information signal from the first processing step, spreading and outputting the signal with the channelization code corresponding to the preamble signature;

a selecting step for selecting either the produced data at the

second transmitting step or the produced preamble at the first transmitting step according to the acquisition indication signal transmitted from the base station;

a second processing step for converting the selected signal at the selecting step into a RF signal and transmitting it to the base station via a wireless channel, and converting an acquisition indication signal in RF signal transmitted from the base station into a baseband signal;

a receiving step for receiving the acquisition indication acquisition of baseband from the second processing step and verifying whether the transmitted preamble signature is acquired or not; and

a second determining step for enabling and disabling the first determining step according to the result verified at the receiving step, and outputting a signal for switching the selecting step.

18. The method of claim 17, wherein the first determining step comprising the step of:

receiving and storing information about the preamble signature set classified by a characteristic of traffic transmitted from the base station via a forward link common channel;

classifying the generated data considering traffic characteristics and request conditions from upper layer, and randomly selecting a preamble signature of the available preamble signatures corresponding to the traffic characteristic;

randomly or deterministically selecting an access slot when the preamble is transmitted; and

determining power of a transmission preamble considering

interference signal level of the base station, forward link path loss, and power level of the preamble transmitted previously if any.

19. The method of claim 17, wherein the first transmitting step transmits the preamble with the preamble signature and the power level at the transmission slot in the first determining step and by modulating common spreading code by the preamble signature.

20. The method of claim 19, wherein the first transmitting step produces a complex band spreading signal whose real value is the same as the imaginary one, using the selected preamble signature and common spreading code.

21. The method of claim 17, wherein the receiving step receives the acquisition indication signal using a sequence corresponding to the transmitted preamble signature and a spreading code assigned to the forward link common channel for acquisition indication transmission.

22. The method of claim 17, wherein the second determining step enables the first determining step and outputs a signal for connecting the output of the first transmitting step to the selecting step, if the positive acquisition or on-acquisition indication signal is received; otherwise, the second determining step disables the first determining step, and connects the output of the second transmitting step to the selecting step.

23. The method of claim 16, wherein the base station further

performs the steps of:

a first step of receiving a RF signal transmitted from the terminal, and transmitting a RF signal to the terminal;

a second step of receiving the preamble transmitted from the terminal via the reverse link common channel from the first step, and performing acquisition of the preamble with all of available preamble signatures;

a third step of verifying the acquisition, determining and outputting the acquired preamble signatures;

a forth step of producing multiple acquisition indication signals corresponding to the acquired preamble signatures inputted from the third step, and outputting the signal to the terminal via the first step; and

a fifth step of receiving time delay information of multiple path obtained from the second step, producing an reverse spreading code by using the information about the acquired preamble signature received from the third step, receiving the data transmitted from the terminal via the reverse link common channel from the first step, and receiving the data processed through modulation and channel decoding.

24. The method of claim 23, wherein the second step comprises the steps of:

receiving the preamble transmitted from the terminal via the reverse link common channel from the first step, and performing acquisition for preamble with all of available preamble signatures;

making the fifth step identify a characteristic of time delay corresponding to the acquired preamble signature, and making the fifth

step be ready to receive a data to be transmitted at pre-defined time if any; and

informing to the third step what preamble signatures are acquired.

25. The method of claim 23, wherein the third step comprises the steps of:

informing a spreading code corresponding to the preamble signature inputted from the second step to the fifth step, and making the fifth step be ready to receive a data to be transmitted at pre-defined time if any; and

producing acquisition indication signals corresponding to only the acquired preambles and outputting the signals to the forth step.

26. The method of claim 23, wherein the forth step transmits the any signals such that the acquisition indication signals are orthogonal or antipodal with each other

27. The method of claim 23, wherein the forth step produces and transmits the acquisition indication signal as pattern of a selected or combined format comprising:

an on-off signal format for dividing the available times into the number of available signatures and assigning each divided time to each available preamble signature, transmitting acquisition indication signals only on the divided times assigned to the acquired preamble signatures, and not transmitting acquisition indication signal on the divided times assigned to the non-acquired preamble signatures;

an antipodal signal format for dividing the available times into the number of available signatures and assigning each divided time to each available preamble signature, transmitting positive acquisition indication signals for acquired preamble signatures and negative acquisition indication signals for non-acquired preamble signatures on all the divided times assigned to the available preamble signatures

an on-off signal format for assigning an orthogonal code to a preamble signature and setting it as a symbol to be transmitted, and transmitting only orthogonal code corresponding to the acquired preamble signature; and

an antipodal signal format for assigning an orthogonal code to the preamble signature and setting it as a symbol, transmitting positive acquisition indication signals for acquired preamble signatures and negative acquisition indication signals for non-acquired preamble signatures with all orthogonal codes assigned to the available preamble signatures.

28. The method of claim 27, wherein the forth step is performed by one of methods comprising:

a puncturing method applied to a prior forward link common channel;

a method using a code orthogonal to the other forward link common channels; and

a method using a code non-orthogonal to the other forward link common channels.

29. The method claim 16, wherein the base station classifies characteristics of data to be transmitted via an reverse link common

channel into a packet and random access for transmitting a short data, a channel reservation request for transmitting a medium data, and a channel request requesting a dedicated channel assignment for transmitting a large and continuous data, assigns the preamble signatures according to the classified characteristics of data to transmit, and transmits information about the assigned preamble signatures via a forward link common channel for all terminals to identify it.

30. The method of claim 29, wherein if data with multiple frame length is served by the packet and random access, the base station sub-classifies the preamble signatures assigned to the packet and random access according to the length of data.

31. The method of claim 29, wherein if data is served by the channel reservation request, the method is performed by the steps of comprising:

the terminal randomly selecting one of the preamble signatures assigned for a channel reservation and transmitting a preamble;

the base station performing code acquisition of the preamble transmitted from the terminals and informing the acquired preamble signature to all terminals via a forward link common channel;

if the terminal receiving an acquisition indication signal for successful preamble acquisition, the terminal selecting randomly one of the preamble signatures assigned for a channel reservation, determining an access slot, and re-transmitting a preamble;

if the terminal receiving an acquisition indication signal for

failing preamble acquisition, the terminal transmitting the data for reservation request and trying a channel reservation after transmitting a data for channel reservation request;

the base station informing a channel reservation, reserved time, a spreading code, and allowable maximum transmission rate to corresponding terminals, if successfully receiving the transmitted data for channel reservation request from a terminal;

the corresponding terminal transmitting data using the spreading code on the reserved time within the allowable maximum transmission rate, and performing a closed loop power control by a power control command though a dedicated or forward link common channel; and

the terminal transmitting an information indicating a completion of data transmission with data in transmitting a final frame, and canceling the channel reservation.

32. The method of claim 31, wherein the terminal transmits data for changing the channel reservation condition with the currently transmitting data in parallel in the same manner of the packet and random access and the channel reservation request during reservation, or multiplex and transmit the data with the previously reserved data.

33. An apparatus, for random access in which multiple terminals transmit data to a base station via reverse link common channel using a code division multiple access, substantially as herein described with reference to and as illustrated in any of the accompanying drawings.

34. A method for random access in which multiple terminals transmit data to a base station via reverse link common channel using a code division multiple access, substantially as herein described with reference to any of the accompanying drawings.

The Patent Office

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Claims searched:	1-34	**Date of search:**	6 June 2000

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Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): H4L (LDGP, LDSWD, LDSWX) H4P (PPEC, PPF)

Int Cl (Ed.7): H04B: 7/26; H04L: 12/56, 29/06; H04Q: 7/36, 7/38

Other: Online: EPODOC, JAPIO, WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2320991 A	[DSC TELECOM] See page 30 line 16 - page 31 line 8.	1,16
A	WO 97/46041 A2	[NOKIA]	
X	WO 97/31429 A1	[LOCKHEED MARTIN] See Figs 4A,4B and page 15 line 20 to page17 line 16.	1,16
A	WO 93/21698 A1	[ERICSSON]	

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